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vascular anastomosis develops and the female of two-sexed pairs is normal.

4. A brief description of some of the outstanding features of the anatomy of the reproductive system of foetal free-martins.

5. A complete statement of the homone theory.

The writer regrets that he should have overlooked such an important contribution as that of Tandler and Keller. Its publication in a journal practically unknown to American biologists, and the fact that no reference to it was found in any of the other literature on the subject until after the war explains the occurrence. The writer's interest in the subject arose originally from the birth of free-martins in his own herd of cattle (from 1909 on); thus brought into immediate contact with the subject he realized its great biological significance and first took up its serious study in 1914. Proximity to the Chicago stockyards from which material could be secured in abundance was another inciting cause to its study.

The main, and very satisfactory, feature of the situation is, however, that the fundamental facts have now been determined from two entirely independent series of investigations, at least to the extent indicated, and that all doubt as to the general cause of this remarkable phenomena must consequently vanish.

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THE ANTISCORBUTIC PROPERTIES OF RAW LEAN BEEF

RECENT publications of Chick and Hume, Hess and Unger, Givens and Mendel, Cohen and Mendel, Harden and Zilva and others have contributed much to our knowledge of the etiology of scurvy and the antiscorbutic properties of food materials. It is quite generally agreed that normal development and well-being in animals are dependent upon certain accessory food factors, known as vitamins, of which there are, at present, three types: (a) fat-soluble A, a growth-promoting vitamine, the absence of which produces xerophthalmia and possibly other patho-

logical conditions, (b) water-soluble B, a growth-promoting vitamine, the absence of which produces polyneuritis, and (c) the antiscorbutic substance, found in certain food materials, which Drummond¹ has named "water-soluble C."

Stefansson² in observing three cases of scurvy in his polar expedition, states that meat, and especially raw meat, prevented and cured scurvy while those of the party who subsisted, from choice, on carbohydrates, casein, cereals and a small amount of cooked meat, became afflicted with the disease.

This is not in agreement with the work of Chick, Hume and Skelton³ or Pitz⁴ for the former were unable to prevent the onset of the disease (in guinea pigs) by the administration of meat juice, while the latter made the same observation except that the administration of dry meat to the oats-milk diet delayed the onset of symptoms. Pitz attributes this to the better plane of protein intake, but we are inclined to believe that this is not the case, for he states that milk was fed *ad libitum* and it is generally agreed that the antiscorbutic properties of milk are proportional to the amount of milk ingested. We are also of the belief that those animals, described by Pitz, which showed improvement when fed meat and salt mixtures, drank more milk on account of the stimulation of thirst, with the result that the symptoms were delayed due to the increased amount of milk ingested.

We have found that, not only must the amount of milk fed in experimental scurvy be carefully controlled, but the diet of the cow is also a very important factor. We shall soon publish data to show that guinea pigs fed on oats and 20 c.c. of "spring milk" (daily) from cows fed on green grass and a

¹ Drummond, J. C., *Lancet* (Lond.), CXCV., No. 4963, No. XV. of Vol. II., p. 482, 1918.

² Stefansson, V., *J. Am. Med. Assn.*, Vol. 71, No. 21, p. 1715, 1918.

³ Chick, H., Hume, E. M., and Skeleton, R. F., *Biochem. J.*, Vol. XII., Nos. 1 and 2, p. 136, 1918.

⁴ Pitz, W., *J. Biol. Chem.*, Vol. XXXVI., p. 439, 1918.

grain ration, develop scurvy later, do not as a rule lose in weight, but on the contrary often gain in weight, live considerably longer and are in a much better physical condition, with the exception that scurvy usually develops, than those animals receiving 25 c.c. of milk from cows on a winter ration of ground oats, corn and barley, corn silage and alfalfa hay. We attribute this, tentatively, to the increased amount of fat soluble A in the "green grass" milk. We are now conducting experiments to ascertain the nature of this growth promoting substance.

In this preliminary paper we wish to state that our experimental work indicates, quite conclusively, that raw, lean beef does not possess antiscorbutic properties, so far as those properties can be tested by observations on guinea pigs. We have fed a cold water extract of meat representing 5, 10, 15 and 20 grams of meat, respectively, to guinea pigs receiving a basal diet of oats (*ad libitum*) and 25 c.c. of autoclaved milk. In all cases the guinea pigs developed scurvy just as soon as those animals which received nothing but oats and milk. When 5 c.c. of orange juice (daily) were added to the oats-milk diet and to the oats-milk-meat extract diet, all animals grew normally and no scurvy developed. We have not depended upon external symptoms and autopsies, solely, but have substantiated our findings by histological examination of the bones.

Owing to the fact that the guinea pig is a herbivorous animal, we have experienced some difficulty in being able to feed definite quantities of solid raw meat. By incorporating finely chopped meat into dry, rolled oats we have been able to show that scurvy will develop in practically the same time as when the meat extract was fed.

The experimental data will be published in the near future.

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AURORAL DISPLAYS

FOLLOWING a faint arch which was visible between 9 and 10 P.M. (75th mer. time), August 10, a crimson aurora extending over the northern sky and up to the magnetic zenith was observed here just before dawn, August 11, 1919. At 3:50 A.M. I noticed through the haze a curtain-like arch with a changing base which averaged about 15° above the horizon in the north, and with ends fading out in the east and west. At 4:00 A.M. a large portion of the western sky above 20° altitude became lighted with a vivid crimson glow. This coloring spread east above the whitish arch on the north until from 4:05 to 4:10 most of the northern sky from the zenith down to an altitude of about 25° was covered with it. The time of greatest brilliance was at 4:05 A.M., when whitish streamers were sharply defined in an arch which crossed the meridian between pole-star and zenith. These streamers converged at the magnetic zenith and formed a faint northern half of the auroral corona. After 4:15 the light of dawn augmenting that of the full moon dimmed the aurora till at 4:25 its last faint shafts of light were fading.

Whitish streamers were visible again at 8:35 P.M. about 50–60° up in the north, and for a little while there was a faint suggestion of an auroral arch: but the cirrus clouds, dense haze and full moon prevented further discernment of this display.

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AN unusual demonstration of the Aurora Borealis occurred at Ogunquit, Maine, on the night of August 11. The lights began at about 9:40 P.M. with the appearance of long, thin cloudlike masses extending horizontally a little west of north and about 25° above the horizon. This almost at once passed into curtain masses to the east, which remained less than ten minutes. The next (third) phase began by the sudden shooting up from the lower cloudlike masses of the long ribs of streak light which extended clear to the zenith.